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Substance Use and Mental Health Problems Among Graduate Students: Individual and Program-Level Correlates

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Abstract

Objective.—This study evaluated variation in substance use and mental health among graduate student subgroups.

Participants.—A sample of 2,683 master's and doctoral students completed an online survey in October 2017.

Methods.—Subgroup variation in behavioral health by demographic and program characteristics, particularly degree type and academic discipline, was explored.

Results.—Compared with academic doctoral students (i.e., PhD students), professional doctoral students (i.e., MD, JD, etc.) were significantly more likely to report high stress levels and moderate or severe anxiety symptoms. Master's students were more likely to report moderate or severe anxiety symptoms and use marijuana than academic doctoral students. Students in the behavioral and social sciences, social work, and arts and humanities disciplines were more likely to use substances and report mental health problems than engineering and business students.

Conclusions.—These findings highlight graduate student subgroups who might require closer attention with respect to access to behavioral health services.

Keywords

Mental health; alcohol use; drug use; graduate students; behavioral health

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Substance use and mental health problems are associated with significant burdens to individuals and their families.[1–3] Young adulthood is a peak stage for the development of behavioral health problems, including generalized anxiety disorder and major depression,[4] as well as alcohol and marijuana use disorders.[5] Several studies have focused on the prevalence of substance use and mental health problems among undergraduate students.[6, 7] Our understanding of the magnitude and correlates of behavioral health issues among graduate students is more limited, despite the overlap between typical age at graduate school enrollment and age of onset for many behavioral health problems. However, there is a growing interest in understanding the service needs of graduate students,[8] considering the possible impact on academic achievement[9, 10] as well as social and occupational functioning.

Each year, about three million students are enrolled in graduate programs in the US, and enrollment is projected to increase to 3.3 million students by 2026.[11] Although they share the commonality of wanting to pursue further academic study, graduate students are highly diverse in terms of demographic characteristics.[12] Furthermore, the number of fields for which one can pursue a master's or doctoral degree is vast and growing. The degree to which these individual and program-level characteristics are associated with behavioral health outcomes is largely unknown. Gaining a deeper understanding of these correlates might help in identifying particular subgroups of students who are at high risk for behavioral health problems or in need of additional services.

Graduate students might be at lower risk for substance use and mental health difficulties because they have a history of succeeding academically, an outcome less likely for those struggling with behavioral health issues.[9, 10] However, many graduate students face interpersonal challenges related to questioning the self-efficacy of achieving traditionally "important" positions in society. While task demands differ by program, graduate students are challenged to think critically, work autonomously, and take on a multitude of service and teaching responsibilities in addition to their academic studies that can contribute to high levels of stress, anxiety, social isolation, and self-doubt.[13] While transitioning to adult roles and responsibilities, such as marriage and parenthood, appears to reduce the risk for substance use,[14, 15] it is unclear whether graduate school enrollment also acts as one of these developmental transitions and has a similar association with decreased substance use.

Different disciplines and degree types might attract students with different predispositions for behavioral health problems, and each program has its own unique set of stressors. A handful of studies have been done on the association between academic discipline and graduate student mental health. Stress, depression, and anxiety appear to be more prevalent among students in the fields of business or humanities compared with medicine and other health professional programs.[16–18] However, limitations of these studies include the evaluation of only two academic disciplines,[16] the assessment of only general emotional distress,[17] or the exclusion of diagnosed mental health disorders.[18]

The majority of existing research on graduate student substance use has utilized small samples of students from a small range of academic disciplines, with little comparison across degree types or areas of study. Higher prevalence estimates of past-year alcohol

consumption have been found in studies of medical and pharmacy students[19–21] as compared with studies that also included students from other academic disciplines,[22] suggesting that alcohol consumption might be more common among health professional students than those in other programs. Marijuana use has typically been studied among samples of health professional students, with past-year use prevalence estimates of about 12% to 14%.[19, 21] Similarly, the nonmedical use of prescription stimulants has been primarily assessed among samples of medical and other health professional students, with estimated lifetime prevalence ranging from 9% to 15%.[21, 23–26] The nonmedical use of other classes of prescription drugs, including analgesics, tranquilizers, and sedatives, are important to study given recent increases in past-month prevalence among young adults.[7]

Besides discipline and degree type, different demographic subpopulations of graduate students might be at increased risk for behavioral health problems, similar to adults in the general population. Being male and non-Hispanic white are associated with substance use disorders among the general population.[5, 27, 28] Being female and non-Hispanic white are associated with anxiety and mood disorders.[4] Similar correlates have been found among graduate students, with being male, younger, and unmarried associated with substance use[19, 20, 29] and being female, non-Hispanic white, older, and unmarried associated with mental health disorders.[17, 30, 31]

A closer examination of whether or not students in certain graduate programs are at elevated risk for behavioral health problems is warranted because it can inform the need for targeted service delivery. This study aimed to evaluate the associations between demographic and program characteristics, particularly degree type and academic discipline, with substance use (i.e., alcohol consumption, marijuana use, and the nonmedical use of prescription drugs) and mental health problems (i.e., lifetime diagnosis of anxiety and depression; and current levels of stress, anxiety, and depression symptoms) among graduate students.

Methods

Study sample

Sampling frame eligibility consisted of all master's and doctoral students ages 18 and older who were enrolled at two large, public universities in the mid-Atlantic region of the US. Combining both universities, the sampling frame was 56% female and 41% white with 48% of students enrolled in master's programs and 47% enrolled in doctoral programs. The remaining 5% were graduate certificate and advanced special students. When compared with the overall graduate student population in the US,[12] this sampling frame was similar with respect to gender but was more racially diverse. In addition, the sampling frame had a much higher prevalence of doctoral students than the overall US graduate student population.

Data collection procedures

In the fall of 2017, an online survey consisting of an eligibility screener and 64 survey questions was sent to all currently enrolled graduate students at both universities (n=16,775). Data collection was open for one month, and three reminder emails were sent weekly after the initial recruitment email. Participants could choose to enter themselves into a raffle, and

350 participants were randomly selected to receive a $10 gift card. Prior to the start of the survey, participants read an online consent form and had the option of agreeing or refusing to participate. Informed consent was obtained by n=4,318 students, and 4% were excluded because they did not meet eligibility criteria (n=643). There were 2,683 completed responses and 992 partially completed responses, representing a response rate of 23%. The research was approved by the Institutional Review Boards at both participating universities.

Measures

Demographic and program characteristics—Standard measures were used to collect data on age, sex, race/ethnicity, international student status, employment status, marital status, combined annual household income, and number of children currently living at home.

Participants indicated if they were seeking a master's degree, academic doctoral degree (e.g., PhD), or a professional doctoral degree (e.g., MD, JD). While participants were provided examples of what might be considered an academic versus a professional doctoral degree, they indicated the category that they felt best described their experience. If students were seeking more than one degree, they were asked to choose their highest degree program.

Participants indicated how many semesters they had been enrolled in their graduate degree program, including the current semester. This variable was recoded into a three-level categorical variable with response options including less than a year, 1 to 2 years, and more than 2 years.

Participants chose from a list of 20 academic disciplines based on graduate programs offered at the participating universities. The academic discipline that participants originally reported was recoded into a 10-level variable: 1) health sciences (i.e., health sciences, medicine, pharmacy, dentistry, nursing, public health, physical therapy); 2) natural and computer sciences (i.e., computer, mathematical, and natural sciences; agriculture and natural resources); 3) engineering; 4) behavioral and social sciences; 5) social work; 6) business; 7) arts and humanities (i.e., architecture, arts and humanities); 8) education; 9) law and public policy; and 10) journalism and information studies.

Participants indicated whether they were currently enrolled full- or part-time. The expected number of years needed to complete their graduate degree was reported and recoded into a three-level categorical variable: 1 to 2 years, 3 to 5 years, and 6 or more years.

Lifetime diagnosis of anxiety—Participants self-reported if they had ever been diagnosed with anxiety by a health professional during their lifetime.

Anxiety symptoms—The 21-item Beck Anxiety Inventory (BAI)[32] was used to assess current anxiety symptoms. Participants ranked how much they have been bothered during the past week by each item ranging from 0 (not at all) to 3 (severely, can barely stand it). Possible scores on the BAI range from 0 to 63, with higher scores indicating higher levels of anxiety symptoms. Based on existing clinical cutoffs, BAI scores are classified as no (0 to 7), mild (8 to 15), moderate (16 to 25), or severe (26 or higher) anxiety symptoms. Anxiety

symptoms were analyzed as a dichotomous variable representing presence of moderate or severe anxiety symptoms.

Lifetime diagnosis of depression—Participants self-reported if they had ever been diagnosed with depression by a health professional during their lifetime.

Depression symptoms—The Beck Depression Inventory (BDI)[33] was used to assess current depression symptoms using a series of 21 statements about how participants have been feeling during the past few days. Possible BDI scores range from 0 to 63, with higher scores indicating increased depression symptoms. Based on existing clinical cutoffs, BDI scores are classified as minimal (0 to 13), mild (14 to 19), moderate (20 to 28), or severe (29 or higher) depression symptoms.[33] Depression symptoms were analyzed as a dichotomous variable representing presence of moderate or severe depression symptoms.

Stress—Stress was assessed using the 10-item Perceived Stress Scale (PSS),[34] which rates items on a 5-point scale ranging from never (0) to very often (4). PSS scores range from 0 to 40, with higher scores indicating higher levels of stress. Due to non-normality, stress was analyzed as a dichotomous variable. PSS scores were put into approximate quartiles, with scores of 24 and higher (the upper quartile) classified as high levels of stress.

Alcohol consumption—The frequency of alcohol consumption was measured by the number of days during the past 12 months where alcohol was consumed. Participants who had at least one drink during the past 12 months were asked how many drinks they consumed on a typical day when they drank during the past 12 months. A dichotomous variable was computed to represent high-risk alcohol consumption. High-risk drinking was operationalized as drinking at least once a month during the past 12 months with a typical quantity of five drinks or more for men and four drinks or more for women, which is an adaptation of the definition of binge drinking.[35]

Marijuana use—The frequency of marijuana use was assessed by the number of days participants had used marijuana during the past 12 months and recoded into a dichotomous variable (use/non-use).

Nonmedical use of prescription drugs—Participants were provided with a definition of nonmedical use as “the intentional use of a medication without a prescription, in a way other than as prescribed, or for the experience or feeling it causes”.[36] Four separate questions were used to measure frequency of nonmedical use of each class of prescription drugs (stimulants, analgesics, tranquilizers, and sedatives) by assessing the number of days used during the past 12 months. A dichotomous variable was computed to represent past-year nonmedical use/non-use of prescription drugs.

Comorbid substance use and mental health problems—A dichotomous variable was computed to represent having at least one mental health problem (high stress level, moderate/severe anxiety symptoms, moderate/severe depression symptoms, lifetime diagnosis of anxiety, lifetime diagnosis of depression) and at least one substance use variable (high-risk alcohol consumption, marijuana use, nonmedical use of prescription drugs).

Statistical analyses

Analyses for this study utilized the 2,683 completed responses. Missing data were found in 754 of these responses (28%) on at least one variable of interest, and comparisons between complete and non-complete cases revealed that the data were not missing at random. Missing data were handled using multiple imputation of five complete datasets, incorporating all study variables, and statistics were obtained by averaging the results across all imputed datasets.

The distributions of all variables were assessed using descriptive statistics. Multivariate logistic regression models were used to predict high stress levels, anxiety symptoms, depression symptoms, lifetime diagnosis of anxiety, lifetime diagnosis of depression, high-risk alcohol consumption, marijuana use, nonmedical use of prescription drugs, and comorbid substance use and mental health problems from each individual demographic and program characteristic variable while adjusting for all other demographic and program characteristics.

SPSS Version 24.0 was used for all analyses, and the alpha level was set at 0.05.

Results

Sample characteristics

Table 1 characterizes the sample of graduate students studied (n=2,683). Participants ranged in age from 20 to 65 years old with an average age of 28. The majority of the sample was female (63%), non-Hispanic white (59%), never married (73%), and did not have children (89%). Almost one-fifth were international students (18%). Forty-four percent of the sample was enrolled in a master's degree program, 39% in an academic doctoral program, and 17% in a professional doctoral program. The majority of students were enrolled in their program full-time (85%) and for two years or less (73%). Students who were pursuing a degree in health sciences comprised the largest proportion of the sample (21%), followed by natural and computer sciences (15%), engineering (12%), behavioral and social sciences (11%), social work (8%), business (8%), arts and humanities (8%), education (7%), law and public policy (7%), and journalism and information studies (4%).

Prevalence of stress, anxiety, and depression

Twenty-one percent of students reported that they had been diagnosed with anxiety in their lifetime (see Table 2), and twenty percent of students reported that they had been diagnosed with depression in their lifetime. Almost a quarter (23%) of students reported current moderate or severe anxiety symptoms and 13% of students reported current moderate or severe depression symptoms. The top quartile of the sample for PSS score (n=661) had a mean score of 27.8 (data not shown).

Prevalence of substance use

Most of the sample (85%) drank alcohol during the past 12 months. Among drinkers, the average frequency was 71 days with a mean typical quantity of 2 drinks per drinking day (data not shown). High-risk alcohol consumption was fairly uncommon, with only 7% of

the sample classified as high-risk drinkers (see Table 2). Twenty percent of the sample used marijuana during the past 12 months, albeit infrequently, with a median past-year frequency of 6 days among users (data not shown). Nonmedical use of prescription drugs was uncommon, with 7% of the sample engaging in any past-year nonmedical use. The most common type of prescription drug used nonmedically was prescription stimulants (4% of participants), followed by tranquilizers (3%), analgesics (2%), and sedatives (2%). Among students who engaged in nonmedical use, the median past-year frequency of nonmedical use of prescription stimulants, tranquilizers, analgesics, and sedatives among users during the past 12 months was 10 days, 5 days, 5 days, and 10 days, respectively (data not shown).

Almost a fifth of participants (17%) reported at least one mental health problem and also engaged in either high-risk alcohol consumption, marijuana use, or the nonmedical use of prescription drugs.

Variation by degree type and academic discipline

Tables 3 and 4 present the adjusted associations between demographic and program characteristics and mental health and substance use variables. In general, students enrolled in professional doctoral degree programs and those in the behavioral and social sciences, social work, and arts and humanities disciplines had the highest prevalence of behavioral health problems. When compared with those enrolled in academic doctoral degree programs, students in professional doctoral degree programs were significantly more likely to report high stress levels and moderate or severe anxiety symptoms. Master's students were also more likely to report moderate or severe anxiety symptoms, use marijuana, and have comorbid substance use and mental health problems when compared with academic doctoral students.

Because they were the largest group, students in the health sciences discipline were used as the reference group for analyses of mental health and substance use variation by academic discipline. Engineering students were significantly less likely to report a lifetime anxiety diagnosis, report moderate or severe anxiety symptoms, engage in the nonmedical use of prescription drugs, or have comorbid substance use and mental health problems, and students in the business discipline were less likely to report high stress levels. Social work and journalism and information studies students were more likely to report both a lifetime anxiety and lifetime depression diagnosis, and students in the arts and humanities discipline were more likely to report moderate or severe anxiety symptoms. Students in the behavioral and social sciences discipline were more likely to engage in high-risk alcohol consumption, and students in the social work and arts and humanities disciplines were more likely to have comorbid substance use and mental health problems. Students in the natural and computer sciences, behavioral and social sciences, social work, arts and humanities, and law and public policy disciplines were all more likely to engage in past-year marijuana use.

Prevalence of substance use and mental health outcomes by degree type and academic discipline can be found in Table 2.

Demographic and program-level correlates

As compared to students aged 20–25 years old, students who were aged 26 and older were significantly more likely to report a lifetime diagnosis of anxiety, lifetime diagnosis of depression, and moderate/severe depression symptoms, as well as engage in the nonmedical use of prescription drugs. Females were significantly more likely than males to report any assessed mental health problem (high stress level, lifetime diagnosis of anxiety, lifetime diagnosis of depression, moderate/severe anxiety symptoms, and moderate/severe depression symptoms), and males were more likely than females to engage in past-year high-risk alcohol consumption and marijuana use. Non-Hispanic white students were more likely than students of other races to report a lifetime diagnosis of both anxiety and depression and were more likely to engage in high-risk alcohol consumption and have comorbid substance use and mental health problems. International students were less likely than domestic students to indicate lifetime mental health diagnoses, past-year marijuana use, or comorbid substance use and mental health problems. In general, graduate students who were married or had children reported less substance use and mental health problems when compared with unmarried students or students without children.

Stress appeared to increase as time enrolled in a program increased, and students with a higher anticipated program length had increased odds of lifetime mental health diagnoses when compared with those who anticipated their program would only take them 1 to 2 years. Having a longer anticipated program length was also associated with increased odds of comorbid substance use and mental health problems.

Comment

This cross-sectional study examined the correlates of mental health and substance use among a diverse sample of graduate students. Degree type and academic discipline were frequently associated with mental health and substance use. Students in the behavioral and social sciences, social work, and arts and humanities disciplines had the highest prevalence of mental health problems when compared to other academic disciplines. One explanation for this difference might be increased mental health knowledge, awareness, and help-seeking given their fields of study, particularly among students in the behavioral sciences. Another explanation for this difference might be possible genetic and environmental factors that predispose students to certain intellectual interests as well as the development of mental health disorders. A notable study by Lipson et al.[18] found that master's students in the humanities and art and design programs had the highest prevalence of depression as compared with master's students in other disciplines, and doctoral students in the same fields had the highest prevalence of anxiety as compared with doctoral students in other disciplines. It has been suggested that students in the arts and humanities face a unique set of stressors surrounding making unique contributions to the field and pressure towards creativity, innovation, and originality.[18]

Degree type also appears to play a role in differences in behavioral health, with professional doctoral students and master's students more likely to report mental health problems than academic doctoral students. No significant differences in substance use were found between academic and professional doctoral students, which is consistent with results from an earlier

study that found no differences in alcohol consumption between clinical and non-clinical students.[22] Each type of doctoral program has a unique set of stressors that might influence mental health and substance use, and there might also be unknown behavioral health correlates among these graduate student subgroups that were not explored in this and prior studies.

This study highlighted particular demographic subgroups of graduate students that might be at increased risk for substance use and mental health problems. Not surprisingly, female students were more likely to report the assessed mental health problems than male students, which is consistent with prior work among general adult[4] and graduate student samples.[17, 30] Male students were more likely to engage in marijuana use and high-risk alcohol consumption than female students, affirming the gender gap in regards to substance use and abuse.[5, 7, 27] Other studies of graduate student samples have found similar gender differences.[19, 20, 37] Being married and having children were associated with less substance use and mental health problems, consistent with prior findings that graduate students with children have lower odds of having or developing a psychiatric disorder[31] and that marriage and parenthood are associated with lower levels of substance use.[5, 14, 15] Other studies that examined the relationship between marriage and children with the substance use of graduate students have found similar results.[19, 20, 29]

Limitations

This study has several strengths, including a large sample of graduate students from a wide range of degree types and academic disciplines. However, results should be interpreted in light of the study's limitations. The study sample included graduate students from only two universities, so results might not be generalizable to other graduate student populations. This sample reported a higher lifetime prevalence of both anxiety and depression diagnoses than other samples of graduate students,[21, 38] and marijuana use among this sample was more prevalent than in studies of health professional students.[19, 21] The current sample also underrepresented graduate students from minority racial and ethnic groups as well as overrepresented students enrolled in doctoral programs when compared with both the sampling frame and the national graduate student population.[12] The response rate for this study was 23%, and there might have been differences between responders and nonresponders on demographic characteristics, program characteristics, and health variables of interest. While validated instruments were used, substance use and mental health estimates were self-reported and subject to social desirability and recall bias.

Information on other substance use and mental health risk factors, such as genetics, family history, personality, emotional regulation, and sensation seeking, were not assessed and therefore not controlled for in this study, which might have affected results and should be the subject of future research. The cross-sectional nature of this study did not allow for assessment of changes in mental health and substance use over time, and future studies should focus on understanding behavioral health patterns throughout the duration of graduate education. These changes might be influenced by stressful life events both internal (e.g., change in advisor, academic struggles) and external (e.g., death in the family, financial problems) to graduate study that might trigger more severe periods of anxiety,

depression, and substance use. Future research should also assess substance use disorders among graduate students, which are prevalent among young adults[35] and are associated with academic difficulties.[10, 39, 40]

Conclusions

This study adds to the literature on individual and program-level correlates of substance use and mental health problems among graduate students. While substance use was infrequent and occurred among a minority of the sample, future research should focus on how to effectively intervene with high-risk students in order to promote student health and success. The lower estimates of substance use observed in this study might represent a developmental shift toward achieving adult milestones, and only future research that compares the trajectories of same age students, some who go on to pursue graduate studies and others who do not, can answer such questions. The correlates of less severe alcohol consumption, particularly moderate alcohol consumption, should also be explored.

The high levels of stress and the prevalence of anxiety and depression among this sample highlight the need for the academic leadership at colleges and universities to address the issue of graduate student mental health throughout the duration of the graduate program and ensure that graduate students are aware of the mental health resources available to them, both at the university and through private providers. Universities should aim to provide services that cater to the unique graduate student experience, and educators at the college and departmental levels should be informed of the behavioral health risks for students in their particular disciplines. Both students and educators should receive training on recognizing the signs of behavioral health problems and how to seek out or direct students to the appropriate services. Increased monitoring and prevention practices would help to better understand the service needs of graduate students, and graduate students should be empowered to take control of their own health to achieve a sustainable work-life balance during graduate school. Results also affirm the need for continued research in this area, particularly longitudinal research that examines the effects of substance use and mental health on the academic achievement of graduate students.

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Table 1.

Sample characteristics, by academic discipline (*n*=2,683)

	Total Sample	Academic Discipline									
		HS	NCS	ENG	BSS	SW	BUS	AH	EDU	LPP	JIS
Total *n* (Row %)	**2,683 (100.0)**	**553 (20.6)**	**403 (15.0)**	**309 (11.5)**	**293 (10.9)**	**222 (8.3)**	**214 (8.0)**	**200 (7.5)**	**198 (7.4)**	**181 (6.7)**	**110 (4.1)**
	Column %										
Age											
20 to 25 years old	42.8	50.5	39.5	54.7	36.2	42.8	40.7	24.0	33.8	52.5	39.1
26+ years old	57.2	49.5	60.5	45.3	63.8	57.2	59.3	76.0	66.2	47.5	60.9
Sex											
Male	37.4	22.4	54.1	72.5	28.3	11.0	52.8	32.8	21.5	41.4	31.8
Female	62.6	77.6	45.9	27.5	71.7	89.0	47.2	67.2	78.5	58.6	68.2
Race/Ethnicity											
Non-Hispanic white	58.6	52.5	66.3	45.6	71.2	64.1	40.4	65.6	62.0	67.6	54.5
Non-Hispanic other race	31.7	38.0	24.7	48.2	17.2	22.3	52.5	23.7	26.2	23.3	34.4
Hispanic/Latino	4.9	3.3	6.0	3.6	5.5	7.3	4.3	3.6	6.3	5.5	5.6
More than one race/ethnicity	4.8	6.2	3.0	2.6	6.1	6.4	2.8	7.1	5.6	3.5	5.5
International Student											
Yes	17.9	7.1	24.8	45.6	10.9	0.5	40.7	13.5	5.8	7.2	27.3
No	82.1	92.9	75.2	54.4	89.1	99.5	59.3	86.5	94.2	92.8	72.7
Employment Status											
Not currently employed	21.7	36.9	7.2	19.4	8.9	31.5	32.7	9.5	9.6	36.2	18.2
Employed part-time	15.8	23.9	3.0	12.6	8.5	40.0	11.7	14.5	10.6	16.7	19.1
Employed full-time	18.9	11.6	11.2	19.1	21.5	18.1	40.2	12.0	29.8	23.2	23.6
University assistantship	43.6	27.7	78.7	48.9	61.1	10.4	15.4	64.0	50.0	23.9	39.1
Marital Status											
Never married	72.7	74.8	73.0	79.0	75.8	74.3	65.9	67.0	61.6	75.9	70.0
Married	24.9	23.0	24.8	20.1	22.2	23.0	31.8	29.5	36.4	21.9	21.8
Widowed/divorced/separated	2.4	2.2	2.2	1.0	2.0	2.7	2.3	3.5	2.0	2.2	8.2
Household Income											
Less than $25,000	44.1	54.6	36.1	36.0	42.0	47.0	31.3	53.0	35.8	53.0	53.3

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	Total Sample	Academic Discipline									
		HS	NCS	ENG	BSS	SW	BUS	AH	EDU	LPP	JIS
Total *n* (Row %)	**2,683 (100.0)**	**553 (20.6)**	**403 (15.0)**	**309 (11.5)**	**293 (10.9)**	**222 (8.3)**	**214 (8.0)**	**200 (7.5)**	**198 (7.4)**	**181 (6.7)**	**110 (4.1)**
$25,000-$50,000	24.4	19.9	38.6	36.1	24.9	25.7	18.7	17.0	15.8	13.9	15.5
$50,000-$100,000	18.2	14.1	17.1	15.0	23.2	17.3	27.1	19.5	23.7	18.1	11.3
More than $100,000	13.2	11.4	8.2	12.9	9.9	10.0	22.9	10.5	24.7	14.9	20.0
Children											
Yes	10.8	10.5	7.2	7.4	8.5	17.6	14.5	11.5	14.6	11.2	10.9
No	89.2	89.5	92.8	92.6	91.5	82.4	85.5	88.5	85.4	88.8	89.1
Degree Type											
Master's degree	44.2	23.7	15.4	44.7	34.5	97.7	92.5	43.5	47.0	42.0	76.4
Academic doctoral degree	38.7	26.2	77.9	50.5	58.0	1.8	6.5	50.5	49.5	6.6	22.7
Professional doctoral degree	17.0	50.1	6.7	4.9	7.5	0.5	0.9	6.0	3.5	51.4	0.9
Time Enrolled											
Less than a year	29.6	26.9	18.4	30.4	27.6	47.3	40.2	24.5	31.3	33.7	29.1
1 to 2 years	43.4	47.4	31.8	40.5	37.5	49.1	49.8	39.0	40.9	56.9	56.4
More than 2 years	27.0	25.7	49.9	29.1	34.8	3.6	10.0	36.5	27.8	9.4	14.5
Student Status											
Part-time	15.1	10.1	5.7	12.6	14.0	10.4	38.8	8.5	26.8	20.4	29.1
Full-time	84.9	89.9	94.3	87.4	86.0	89.6	61.2	91.5	73.2	79.6	70.9
Anticipated Program Length											
1 to 2 years	33.5	20.4	9.4	39.2	31.1	69.9	64.5	21.5	37.4	32.0	61.8
3 to 5 years	49.9	73.9	48.1	47.2	39.0	28.7	35.0	51.5	42.9	65.7	27.3
6 or more years	16.6	5.8	42.4	13.6	29.9	1.4	0.5	27.0	19.7	2.2	10.9

Note. Percentages might not add up to sample totals due to the rounding of pooled estimates.

HS=Health Sciences; NCS=Natural and Computer Sciences; ENG=Engineering; BSS=Behavioral and Social Sciences; SW=Social Work; BUS=Business; AH=Arts and Humanities; EDU=Education; LPP=Law and Public Policy; JIS=Journalism and Information Studies.

Table 2.

Substance use and mental health, by degree type and academic discipline (n=2,683)

	Total	Degree Type				Academic Discipline								
		MAS	ADOC	PDOC	HS	NCS	ENG	BSS	SW	BUS	AH	EDU	LPP	JIS
Total *n* (Row %)	**2,683 (100.0)**	**1,187 (44.2)**	**1,039 (38.7)**	**457 (17.0)**	**553 (20.6)**	**403 (15.0)**	**309 (11.5)**	**293 (10.9)**	**222 (8.3)**	**214 (8.0)**	**200 (7.5)**	**198 (7.4)**	**181 (6.7)**	**110 (4.1)**
							Column %							
Mental Health														
High Stress Level	24.6	21.5	25.4	30.9	27.6	27.8	18.2	30.7	23.0	12.1	31.5	18.7	26.5	22.7
Lifetime Anxiety Diagnosis	20.8	21.5	20.2	20.6	20.1	17.4	8.4	28.6	33.8	12.1	25.5	21.0	22.7	30.0
Moderate/Severe Anxiety Symptoms	22.6	24.8	17.9	27.3	25.0	20.4	13.1	20.5	33.4	18.7	30.4	19.8	26.2	20.9
Lifetime Depression Diagnosis	20.0	19.8	21.9	16.1	16.8	20.1	9.4	23.5	35.4	8.9	26.5	22.1	22.1	27.3
Moderate/Severe Depression Symptoms	12.9	12.1	13.2	14.2	13.3	14.4	9.7	16.9	9.7	7.9	16.5	10.1	13.7	16.4
Substance Use														
High-Risk Alcohol Consumption	6.7	8.2	4.2	8.6	5.8	4.5	5.4	10.6	7.8	9.8	4.5	3.5	12.2	6.4
Marijuana Use	20.3	21.5	19.0	20.3	15.9	23.3	9.4	27.6	29.7	13.1	29.0	18.7	24.2	18.2
Nonmedical Use of Prescription Drugs	7.1	6.6	6.6	9.5	8.9	5.7	1.9	10.2	10.4	5.1	8.5	6.1	7.1	5.5
Comorbid Substance Use and Mental Health Problems	17.2	17.6	16.0	18.6	16.1	18.1	4.4	20.8	28.2	9.8	29.2	13.1	20.2	17.3

Note. Percentages might not add up to sample totals due to the rounding of pooled estimates.

MAS=Master's; ADOC=Academic doctoral; PDOC=Professional doctoral; HS=Health Sciences; NCS=Natural and Computer Sciences; ENG=Engineering; BSS=Behavioral and Social Sciences; SW=Social Work; BUS=Business; AH=Arts and Humanities; EDU=Education; LPP=Law and Public Policy; JIS=Journalism and Information Studies.

High Stress Level is defined as a score of 24 or higher on the Perceived Stress Scale; Moderate/Severe Anxiety is defined as a score of 16 or higher on the Beck Anxiety Inventory; Moderate/Severe Depression is defined as a score of 20 or higher on the Beck Depression Inventory.

All substance use variables assess use during the past 12 months.

High-Risk drinkers drank alcohol at least once a month during the past 12 months and had a typical quantity of five or more drinks for men or four or more drinks for women. Nonmedical use of prescription drugs includes the nonmedical use of prescription stimulants, analgesics, tranquilizers, or sedatives.

Comorbidity represents having at least one of the five measured mental health problems and at least one of three measured substance use outcomes.

Table 3.

Results of logistic regression models on the associations between program characteristics and mental health problems among graduate students (n=2,683)

	High Stress Level	Lifetime Anxiety Diagnosis	Moderate/Severe Anxiety Symptoms	Lifetime Depression Diagnosis	Moderate/Severe Depression Symptoms
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Degree Type					
Academic doctoral degree	Reference	Reference	Reference	Reference	Reference
Master's degree	1.24 (0.89, 1.74)	1.30 (0.92, 1.86)	1.55 (1.10, 2.18) *	1.16 (0.82, 1.65)	1.38 (0.91, 2.09)
Professional doctoral degree	1.48 (1.06, 2.06) *	0.93 (0.64, 1.34)	1.50 (1.06, 2.13) *	0.69 (0.47, 1.00)	1.21 (0.79, 1.84)
Academic Discipline					
Health Sciences	Reference	Reference	Reference	Reference	Reference
Natural and Computer Sciences	1.11 (0.78, 1.59)	0.84 (0.57, 1.26)	1.08 (0.74, 1.58)	1.05 (0.70, 1.56)	1.27 (0.81, 1.99)
Engineering	0.87 (0.58, 1.30)	0.54 (0.33, 0.89) *	0.59 (0.38, 0.91) *	0.67 (0.41, 1.09)	0.99 (0.56, 1.67)
Behavioral and Social Sciences	1.24 (0.87, 1.77)	1.39 (0.96, 2.02)	0.97 (0.65, 1.43)	1.15 (0.78, 1.71)	1.36 (0.87, 2.12)
Social Work	0.89 (0.58, 1.37)	1.62 (1.07, 2.45) *	1.41 (0.93, 2.15)	2.13 (1.40, 3.25) *	0.62 (0.34, 1.13)
Business	0.56 (0.34, 0.93) *	0.75 (0.44, 1.27)	0.77 (0.48, 1.23)	0.61 (0.34, 1.10)	0.71 (0.38, 1.33)
Arts and Humanities	1.30 (0.87, 1.92)	1.21 (0.79, 1.85)	1.61 (1.07, 2.42) *	1.29 (0.84, 1.98)	1.27 (0.77, 2.08)
Education	0.71 (0.46, 1.10)	0.98 (0.63, 1.52)	0.93 (0.60, 1.43)	1.11 (0.71, 1.73)	0.82 (0.46, 1.43)
Law and Public Policy	1.07 (0.72, 1.58)	1.18 (0.77, 1.80)	1.11 (0.74, 1.66)	1.51 (0.97, 2.34)	1.13 (0.68, 1.88)
Journalism and Information Studies	0.94 (0.55, 1.59)	1.87 (1.12, 3.13) *	0.90 (0.53, 1.55)	1.81 (1.06, 3.09) *	1.34 (0.72, 2.48)
Time Enrolled					
Less than a year	Reference	Reference	Reference	Reference	Reference
1 to 2 years	1.55 (1.23, 1.95) *	1.00 (0.79, 1.27)	1.08 (0.86, 1.36)	0.94 (0.73, 1.20)	1.27 (0.94, 1.70)
More than 2 years	1.59 (1.18, 2.15) *	0.92 (0.67, 1.27)	0.84 (0.61, 1.15)	1.00 (0.73, 1.38)	1.24 (0.85, 1.82)
Student Status					
Part-time	Reference	Reference	Reference	Reference	Reference
Full-time	1.10 (0.79, 1.54)	1.23 (0.86, 1.74)	1.16 (0.82, 1.64)	1.31 (0.92, 1.88)	1.15 (0.75, 1.75)
Anticipated Program Length					
1 to 2 years	Reference	Reference	Reference	Reference	Reference
3 to 5 years	1.07 (0.79, 1.44)	1.41 (1.03, 1.93) *	1.27 (0.93, 1.73)	1.53 (1.11, 2.10) *	1.24 (0.85, 1.83)

	High Stress Level	Lifetime Anxiety Diagnosis	Moderate/Severe Anxiety Symptoms	Lifetime Depression Diagnosis	Moderate/Severe Depression Symptoms
	AOR (95% CI)	**AOR (95% CI)**	**AOR (95% CI)**	**AOR (95% CI)**	**AOR (95% CI)**
6 or more years	1.44 (0.95, 2.18)	1.84 (1.18, 2.86) *	1.40 (0.90, 2.19)	1.70 (1.09, 2.65) *	1.60 (0.95, 2.70)

Note.

* $p<0.05$

High Stress Level is defined as a score of 24 or higher on the Perceived Stress Scale; Moderate/Severe Anxiety is defined as a score of 16 or higher on the Beck Anxiety Inventory; Moderate/Severe Depression is defined as a score of 20 or higher on the Beck Depression Inventory.

AOR=Adjusted Odds Ratio. Adjusted estimates control for demographic variables (age, sex, race/ethnicity, international student status, employment status, marital status, household income, and children) and all other program variables, regardless of unadjusted significance.

Table 4.

Results of logistic regression models on the associations between program characteristics and substance use among graduate students (n=2,683)

	High-Risk Alcohol Consumption	Marijuana Use	Nonmedical Use of Prescription Drugs	Comorbid Substance Use and Mental Health Problems
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Degree Type				
Academic doctoral degree	Reference	Reference	Reference	Reference
Master's degree	1.33 (0.72, 2.44)	1.51 (1.05, 2.18) *	1.29 (0.74, 2.25)	1.56 (1.06, 2.31) *
Professional doctoral degree	1.75 (0.94, 3.25)	1.34 (0.92, 1.95)	1.31 (0.77, 2.24)	1.27 (0.85, 1.88)
Academic Discipline				
Health Sciences	Reference	Reference	Reference	Reference
Natural and Computer Sciences	1.00 (0.49, 2.04)	1.57 (1.05, 2.35) *	0.74 (0.40, 1.37)	1.10 (0.72, 1.68)
Engineering	0.79 (0.38, 1.63)	0.64 (0.39, 1.06)	0.30 (0.12, 0.77) *	0.29 (0.15, 0.55) *
Behavioral and Social Sciences	2.33 (1.27, 4.27) *	2.00 (1.35, 2.96) *	1.32 (0.76, 2.29)	1.31 (0.87, 1.99)
Social Work	1.39 (0.67, 2.87)	2.20 (1.42, 3.42) *	1.25 (0.66, 2.37)	1.85 (1.16, 2.93) *
Business	1.55 (0.76, 3.15)	1.16 (0.68, 1.97)	0.83 (0.38, 1.81)	0.79 (0.44, 1.40)
Arts and Humanities	1.04 (0.45, 2.38)	2.16 (1.39, 3.35) *	1.03 (0.53, 2.01)	2.09 (1.35, 3.26) *
Education	0.73 (0.30, 1.80)	1.38 (0.86, 2.12)	0.80 (0.39, 1.63)	0.87 (0.52, 1.45)
Law and Public Policy	1.72 (0.94, 3.13)	1.56 (1.01, 2.40) *	0.80 (0.41, 1.56)	1.27 (0.81, 1.98)
Journalism and Information Studies	1.11 (0.44, 2.79)	1.35 (0.75, 2.44)	0.77 (0.30, 1.97)	1.24 (0.68, 2.25)
Time Enrolled				
Less than a year	Reference	Reference	Reference	Reference
1 to 2 years	0.91 (0.64, 1.30)	1.11 (0.87, 1.41)	1.04 (0.71, 1.51)	1.03 (0.80, 1.34)
More than 2 years	1.01 (0.59, 1.71)	1.12 (0.81, 1.55)	1.13 (0.68, 1.86)	0.92 (0.64, 1.30)
Student Status				
Part-time	Reference	Reference	Reference	Reference
Full-time	1.10 (0.62, 1.92)	1.11 (0.76, 1.61)	1.39 (0.79, 2.42)	1.48 (1.00, 2.21)
Anticipated Program Length				
1 to 2 years	Reference	Reference	Reference	Reference
3 to 5 years	0.84 (0.50, 1.40)	1.17 (0.85, 1.61)	1.54 (0.92, 2.57)	1.48 (1.04, 2.11) *

	High-Risk Alcohol Consumption	Marijuana Use	Nonmedical Use of Prescription Drugs	Comorbid Substance Use and Mental Health Problems
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
6 or more years	0.52 (0.23, 1.16)	1.24 (0.79, 1.96)	1.31 (0.65, 2.65)	1.90 (1.17, 3.11) *

Note.

* $p<0.05$

All substance use variables assess use during the past 12 months.

High-Risk drinkers drank alcohol at least once a month during the past 12 months and had a typical quantity of five or more drinks for men or four or more drinks for women. Nonmedical use of prescription drugs includes the nonmedical use of prescription stimulants, analgesics, tranquilizers, or sedatives.

AOR=Adjusted Odds Ratio. Adjusted estimates control for demographic variables (age, sex, race/ethnicity, international student status, employment status, marital status, household income, and children) and all other program variables, regardless of unadjusted significance.